**Work-Energy-Power Summary Sheet**

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| **Work – Force x Distance** | **Energy – KE, PE, and Total Energy (ET)** |
| 1. **Work = W = (F cosθ)s**     1. F = Applied Force (N)    2. s = distance over which force acts    3. θ = angle between force and displacement 2. Work can be positive, zero, or negative 3. Units are N-m or Joules (J) 4. Work is a scalar quantity, not a vector | **Kinetic Energy = KE = ½ mv2 Joules = Energy of Motion**  m = mass in kg  v = velocity in m/s   1. KE cannot be negative but can be zero (if v = 0) 2. If velocity is doubled, KE is quadrupled 3. KE is a scalar quantity   **Gravitational Potential Energy = PE = mgh Joules**   1. Energy of Position 2. Gravitational Potential Energy is the energy an object of mass m has by virtue of its position relative to the surface of the earth. 3. PE can be positive, negative, or zero 4. The PE = 0 level can be arbitrarily chosen   **Total Mechanical Energy ET = KE + PE = ½ mv2 + mgh**  Total Mechanical Energy is the sum of KE and PE |
| **Work-Energy Theorem** | **Conservative Forces** |
| 1. **Work = W = KEf – KEo**    1. Work = net work done by all forces    2. KEf = final kinetic energy = ½ mvf2    3. KEo = initial kinetic energy = ½ mvo2 2. **Positive work** will increase the KE of an object - A force in the direction of motion will increase the speed of the object 3. **Negative work** will decrease the KE of an object - A force in the opposite direction of motion will decrease the speed of the object | Definition of a conservative force:   1. Work done by the force on a moving object is **independent** of the **path** between the objects initial and final position. 2. **No net work** is done on an object moving around a **closed path**.   **Conservative Forces**: Gravity, Spring Force  **Non-Conservative Force**: friction, tension, etc |
| **Conservation of Mechanical Energy** | **Power = work/time** |
| 1. If the work done by non-conservative forces = 0, then Mechanical Energy is conserved.   If WNC = 0, then Ef = Eo  If WNC = 0, then (KEf + PEf) = (KEo + PEo)   1. If Mech Energy is conserved, then PE is traded for KE and visa versa. ET remains constant.   Problem Solving Approach   1. Make sure that WNC = 0 (no friction, etc) 2. Choose the location where PE = 0 3. Set Ef = Eo and solve for unknown(s)    1. ½mvf2 + mghf = ½mv02 + mgh0 | 1. Average Power = Rate at which work is done 2. watts (J/s) 3. Units are J/s or Watts (W) 4. Scalar quantity |